

# Clean Air Act Task Force

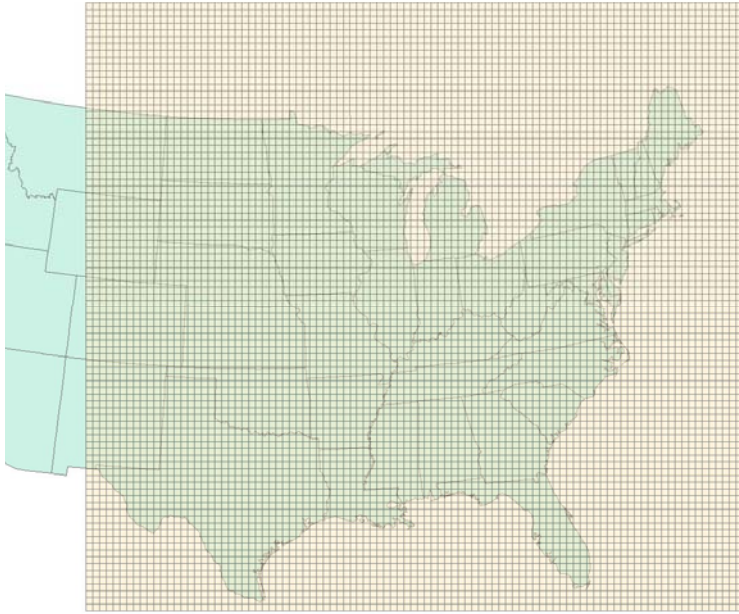
## 5 June 2006

Presentation on Air Quality Modeling,  
Weight of Evidence, and  
Costs/Benefits of EGU Control  
Programs

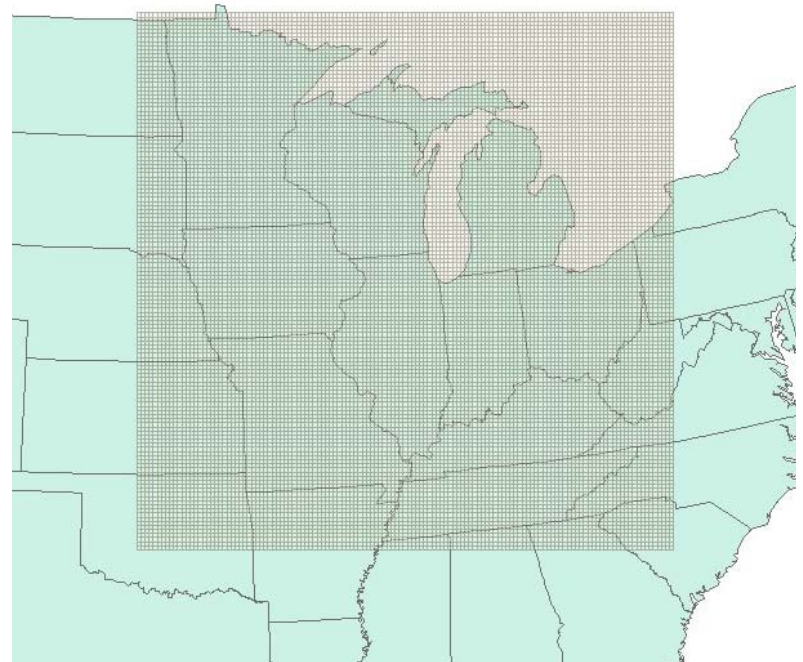
# Results of Round 3 and Round 4 CAMx Modeling for Wisconsin

Information Taken from Work by  
the Lake Michigan Air Directors  
Consortium

# CAMx Domains for PM and Ozone



PM grids: ~ 36 km x 36 km  
Ran full year  
Daily estimates



Ozone grids: ~ 12 km x 12 km  
Ran 90 days (June–August)  
Hourly estimates

# Air Quality Modeling

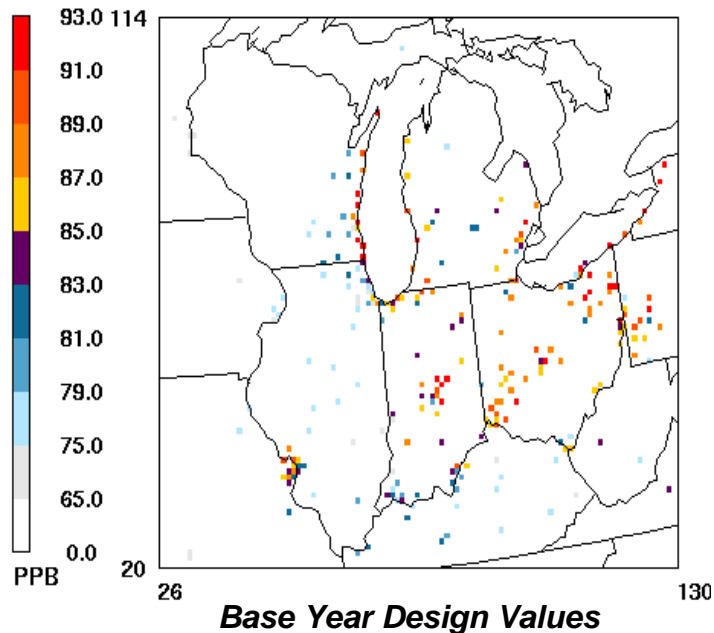
$$\text{FY D.V.} = \text{BY D.V.} \times \text{RRF}$$

where: BY D.V. = (a) 3-year period used for designations ('01-'03)

(b) 3-year period “straddling” inventory base year ('01-'03)

(c) highest design value in three 3-year periods which include inventory base year

*(d) average of three 3-year periods which include inventory base year ('00-'02, '01-'03, '02-'04)*



# Control Strategy Options

Control Measure	CAIR – Full Trading	EGU1 – 5 States	Commissioner’s Package	All Minimum	All Maximum
Existing – OTB Controls Existing – OTB Controls	X	X	X	X	X
Power Plants		EGU1		EGU1	EGU2
Other Point Sources ICI Boilers			X	ICI1 + cement kilns, asphalt plants & glass mfg.	ICI3 + cement kilns, asphalt plants & glass mfg.
Area Sources AIM Consumer Products PFC			X	X + auto refinish, degreasing, srfc. coat, gas disp. fac., & asphalt pave	X + auto refinish, degreasing, srfc. coat, gas disp. fac., & asphalt pave
Highway Mobile Chip Reflashing Vol. Diesel Retrofit Low RVP (select areas)			X	X	X

## 2009 Round 4 Ozone Results (ppb)

County	Base Year DV	CAIR – Full Trading	CAIR - Budgets	EGU1 - 5 States	All Minimum	All Maximum
Kenosha	<b>96.0</b>	<b>89.8</b>	<b>89.6</b>	<b>89.7</b>	<b>89.0</b>	<b>88.6</b>
	<b>98.3</b>	<b>92.0</b>	<b>91.9</b>	<b>91.9</b>	<b>91.2</b>	<b>90.7</b>
Racine	<b>91.7</b>	84.9	84.9	84.8	84.2	83.7
Milwaukee	<b>91.0</b>	84.2	84.2	84.1	83.5	82.9
	<b>91.0</b>	84.9	84.2	84.9	83.5	83.0
Ozaukee	<b>93.0</b>	<b>85.4</b>	<b>85.4</b>	<b>85.3</b>	84.6	84.0
Sheboygan	<b>97.0</b>	<b>88.9</b>	<b>88.6</b>	<b>88.8</b>	<b>87.8</b>	<b>87.1</b>
Kewaunee	<b>89.3</b>	81.0	81.3	80.9	80.5	79.8
Door	<b>91.0</b>	81.8	82.2	81.7	81.6	80.8

## 2012 Round 4 Ozone Results (ppb)

County	Base Year DV	CAIR – Full Trading	EGU1 - 5 States	Commissioners' Package	All Minimum	All Maximum
Kenosha	<b>96.0</b>	<b>88.2</b>	<b>87.8</b>	<b>87.3</b>	<b>86.7</b>	<b>86.0</b>
	<b>98.3</b>	<b>90.3</b>	<b>89.9</b>	<b>89.4</b>	<b>88.8</b>	<b>88.1</b>
Racine	<b>91.7</b>	82.9	82.5	82.1	81.5	80.8
Milwaukee	<b>91.0</b>	82.3	81.7	81.1	80.2	79.5
	<b>91.0</b>	82.4	82.0	82.2	81.5	80.2
Ozaukee	<b>93.0</b>	82.9	82.4	81.7	80.9	80.1
Sheboygan	<b>97.0</b>	<b>86.4</b>	<b>85.8</b>	<b>85.4</b>	84.5	83.6
Kewaunee	<b>89.3</b>	79.1	78.5	77.6	76.9	76.4
Door	<b>91.0</b>	79.3	78.8	77.9	77.2	76.7

**2009 CAIR**  
**% Contribution to 85 ppb Ozone (Round 3)**

State	Chiwaukee	Harrington Beach	Sheboygan
Wisconsin	10	33	24
Illinois	32	24	19
Indiana	5	7	8
Missouri	8	7	7

**2009 CAIR**  
**% Contribution to 85 ppb Ozone (Round 3)**

Source Sector	Chiwaukee	Harrington Beach	Sheboygan
EGU	9	7	11
Non-EGU	11	10	9
Area	6	8	6
Off-Road	12	17	11
Highway	29	36	30
Biogenic	5	6	5
Boundary Conditions	29	16	27

# Weight of Evidence

Information Taken from Work by  
the Lake Michigan Air Directors  
Consortium

# “Guideline on the Use of Models and Other Analyses in Attainment Demonstrations for the 8-hour Ozone NAAQS”, October 2005

*If the future year modeled design values are “close” to NAAQS, then a WOE demonstration should be conducted to determine if aggregate supplemental information support the modeling result*

# Weight of Evidence Plan

- Air quality modeling (based on guidance)
- Air quality modeling (alternative assumptions)
- Trends-based assessment (monitoring plus emissions data)
- Observation-based methods
- Source apportionment analyses
- Trajectory-based analyses

# BY D.V.: Example

Chiwaukee Prairie:        '00-'02   100 ppb  
                                     '01-'03   101 ppb  
                                     '02-'04    94 ppb

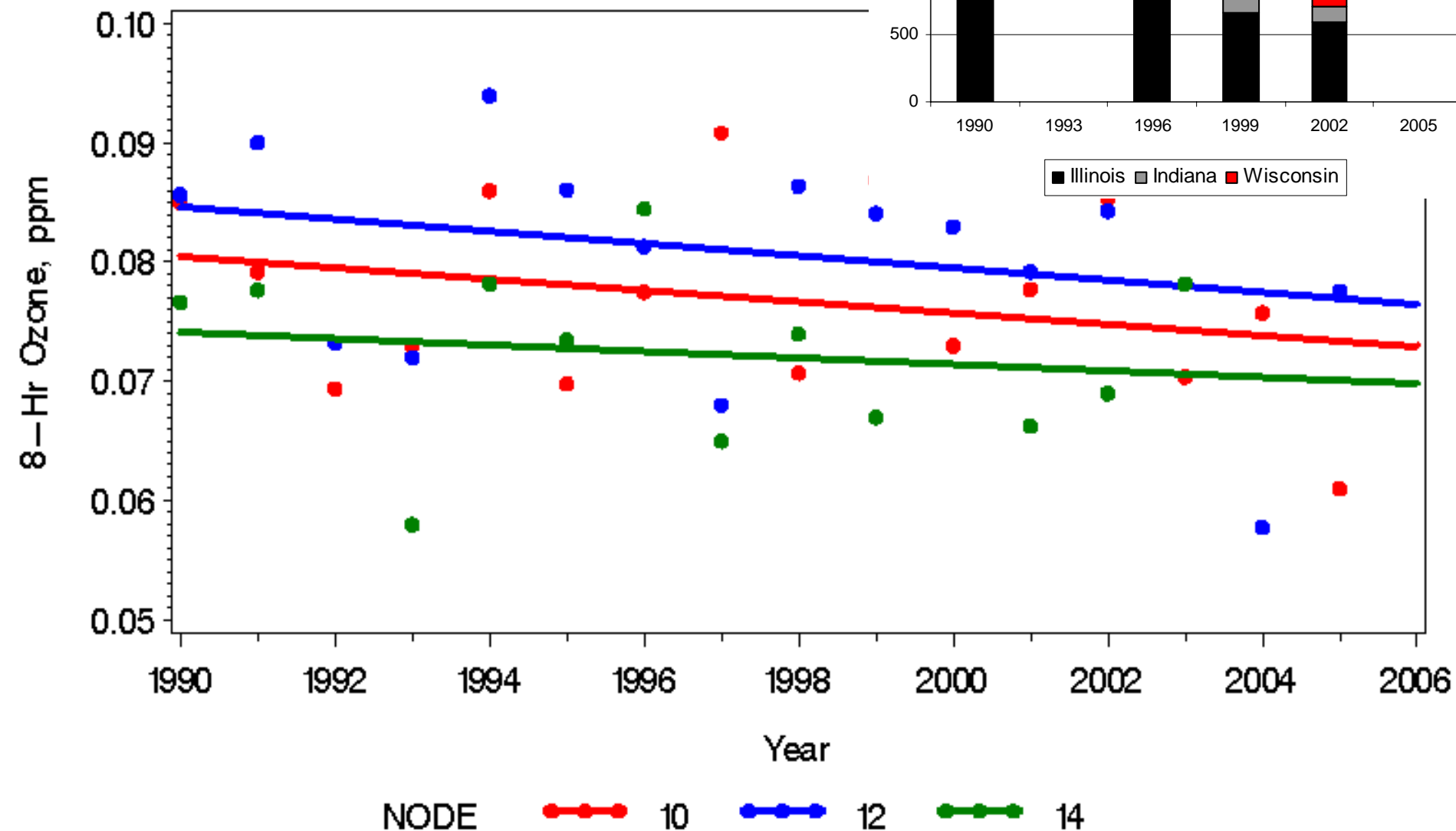
- (a) 3-year period used for designations ('01-'03)        101 ppb
- (b) 3-year period centered on inv. base year ('01-'03)   101 ppb
- (c) highest design value in three 3-year periods which include inventory base year   101 ppb
- (d) average of three 3-year periods which include inventory base year ('00-'02, '01-'03, '02-'04)        98.3 ppb*
- (e) 5-year period centered on inv. base year ('00-'04)    93.4 ppb
- (f) 3-year period centered on inv. base year w/ met adjustment ('01-'03)        ?????
- (g) 2002 estimate based on regression line for '00-'04   94.0 ppb

# 2009 Round 4 Ozone Results (ppb)

## Alternative Base-Year Design Values

Monitoring Site	Base Year DV Three 3-Year Periods	3-Year Period 2002 - 2004	5-Year 2001 - 2005	2002 Theil Trend	3-Year Meteorological Adjustment
Chiwaukee Base Year DV	<b>98.3</b>	<b>101.0</b>	<b>93.4</b>	<b>94.0</b>	
Chiwaukee 2009 Modeling	<b>90.3</b>	<b>94.4</b>	<b>87.3</b>	<b>87.9</b>	
Bayside Base Year DV	<b>91.0</b>	<b>94.7</b>	<b>88.0</b>	<b>92.5</b>	
Bayside 2009 Modeling	82.4	<b>87.6</b>	81.4	<b>85.6</b>	
Sheboygan Base Year DV	<b>97.0</b>	<b>100.0</b>	<b>93.6</b>	<b>95.0</b>	
Sheboygan 2009 Modeling	<b>88.6</b>	<b>91.6</b>	<b>85.7</b>	<b>87.0</b>	

# 8-Hr Ozone Trends, Milwaukee



Each node shares similar meteorological characteristics, so these trends are in essence meteorologically adjusted

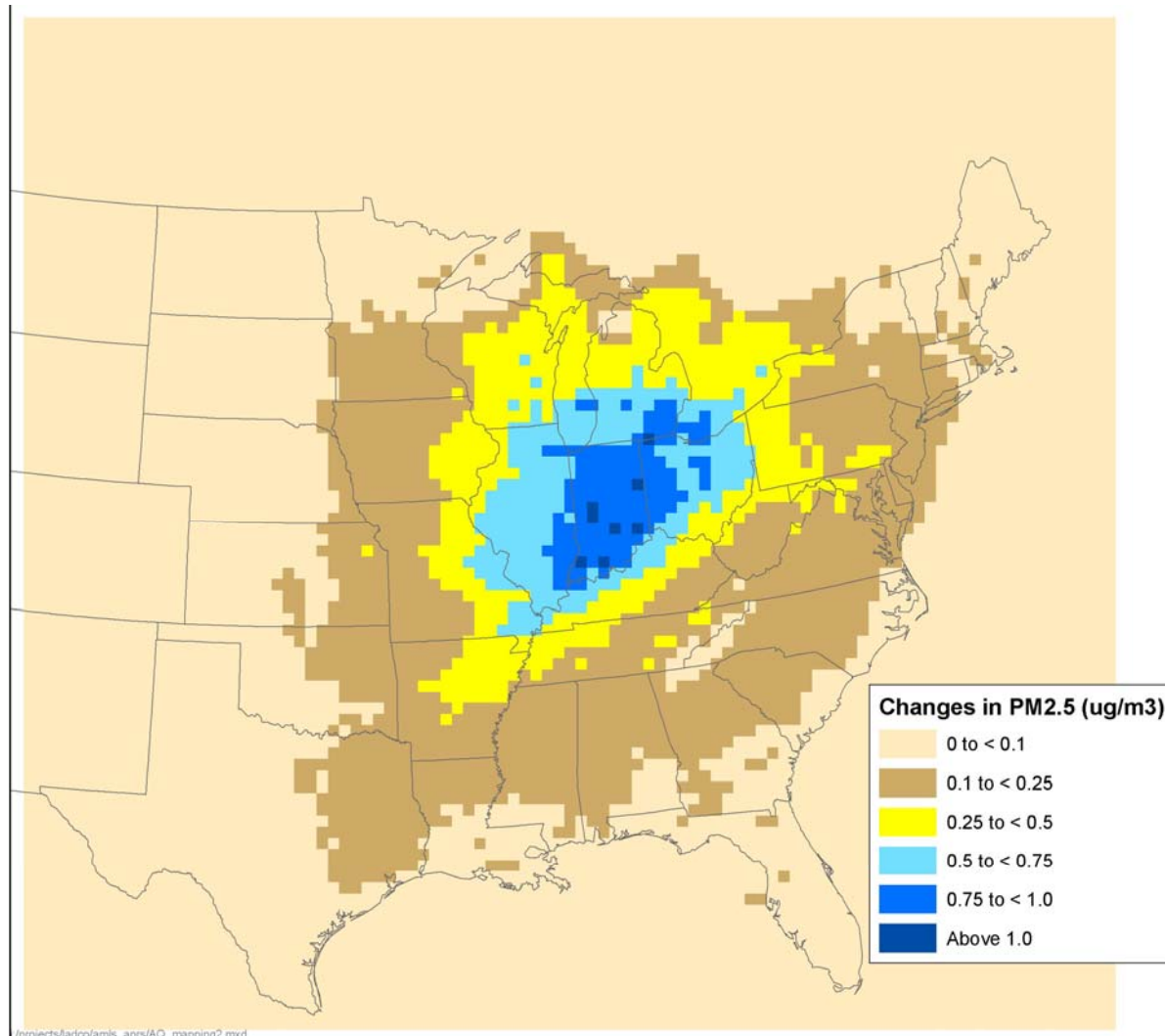
# Costs and Benefits of EGU Controls in the Lake Michigan Region

Information Taken from Preliminary  
Work by Leland Deck and Stratus  
Consulting for the Lake Michigan Air  
Directors Consortium

# EPA Estimates of Health Effect Values

Values Per Health Effect		
	Value (1999\$)	Source of Valuation
Premature Mortality	\$6,000,000	Wage Studies, WTP
Chronic Bronchitis	\$380,000	WTP
Heart Attack (MI)	\$66,000 to \$140,000	Hosp. Costs + Wage Loss
Hospital Admissions	\$6,600 to \$18,400	Medical Costs
ER Visits	\$286	Medical Costs
Symptom Days	\$17 to \$43 / day	WTP
Work Loss Days	\$75	Median Wage

# Change in PM<sub>2.5</sub> Levels with EGU1



Change in  
annual mean  
PM<sub>2.5</sub> levels

Max = 1.12 μg/m<sup>3</sup>

# ~55% of Avoided Health Effects Occur in MRPO States

- ▶ Any change in PM<sub>2.5</sub> levels lead to health effects
  - ▶ Large populations in East receiving small PM<sub>2.5</sub> improvements produce substantial benefits
- ▶ Future air quality analysis based on IPM runs will change picture of distribution of benefits
  - ▶ Emissions 'exported' to nearby states will decrease PM<sub>2.5</sub> improvements in MRPO states
  - ▶ Increasing emissions in southern states will increase PM<sub>2.5</sub> exposure there, even causing worse PM<sub>2.5</sub> levels in southern tier states

# Estimated Value of Avoidable Health Effects

Value of Avoidable Health Effects (Millions of 1999\$)		
	EGU1	EGU2
Mortality	\$15,824	\$18,576
Chronic Bronchitis	\$717	\$841
Heart Attack (MI)	\$775	\$907
Hospital Admit, Cardiovascular	\$24	\$29
Hospital Admit, Respiratory	\$21	\$25
Emergency Room Visits	\$2	\$2
Acute Bronchitis	\$2	\$2
Upper Resp. Symptom Days	\$54	\$63
Lower Resp. Symptom Days	\$1	\$1
Asthma "Attack"	\$2	\$2
Work Loss Days	\$44	\$51
TOTAL	\$17,500	\$20,500

# Benefit-Cost Discussion

- Preliminary measured benefits certainly exceed costs
  - Adding ozone benefits will increase total benefits, probably ~ 10%.
- Incremental benefit – cost analysis
  - EGU1 costs \$0.9 Billion, produces \$17.5 Billion benefits
  - EGU2 costs an additional \$0.4 Billion, produces additional \$3 Billion benefits
- Revising AQ modeling to match IPM emissions results will reduce benefits results